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Peach Diseases and their Control in Tennessee

University of Tennessee Agricultural Experiment Station

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THE UNIVERSITY OF TENNESSEE
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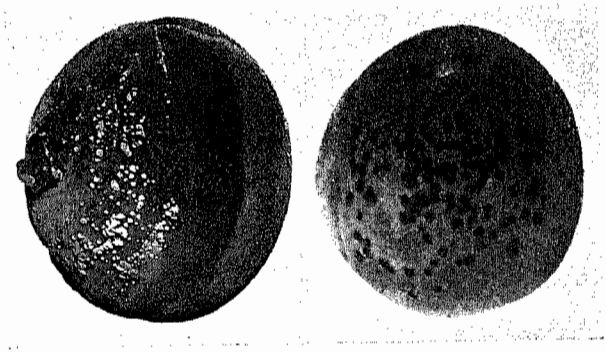

Brown rot Scab

The two common peach fruit diseases.

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PEACH DISEASES AND THEIR CONTROL IN TENNESSEE

By

C. D. SHERBAKOFF AND J. O. ANDES

Under conditions as found in this State, and with the varieties commonly grown, peaches cannot be produced even for home use without systematic disease and insect control. With proper treatment, particularly sanitation and spraying, all pests of the peach except oriental fruit moth can be profitably controlled, provided the size of the orchard and other conditions permit the economic use of necessary spraying equipment. This has been shown by experiments carried out during the past few years and by our own observations and the experience of fruit growers. While the present publication has special reference to disease control, a brief discussion of the more important insect pests is included, because control of certain diseases is impracticable without control of certain insects.

THE MORE IMPORTANT PEACH DISEASES AND THEIR CONTROL

BROWN ROT

The most common disease of the peach is brown rot, so named because of its appearance. Ripe and semi-ripe fruit, especially the former, is particularly susceptible, and fruit infected with this disease, whether on the tree or in storage, will be quickly destroyed. The same fungus early in the season may cause blossom blight, with resulting loss of fruit set, and later may appear as twig blight. Under moist conditions the fungus produces a grayish-brown growth, composed mainly of dust-like masses of spores, over the infected part of the fruit. These spores are related to the fungus the same as seeds to higher plants. Being very small, the spores are easily carried by air currents. If there be peaches, plums, or cherries near, and sufficient moisture be present, the spores will germinate and grow into the susceptible plant tissues, thus establishing new centers of the disease. Fruit affected with the rot may dry up and form so-called "mummies". Many of these mummies will hang on the trees over winter, and, as long as moisture is present, will continue to produce masses of spores through the growing season, starting new infections. Some of the mummies may fall to the ground and remain there throughout the winter in close contact with the soil. The following spring these mummies will produce small cup-shaped fruiting bodies, from which great masses of spores will be shot into the air, after sufficient rain, and carried by air currents to the tree and fruit, likewise starting the disease.

Proper spraying—that is, timely and thorough covering of all susceptible parts of the tree with an effective fungicide—prevents spores of the fungus from developing and growing into the plant tissues even when there is sufficient moisture present. Destruction of all rotted fruit and mummies reduces the chances for new infection and thus makes control by spraying more effective. Finally, brown rot enters the fruit most easily through mechanical injuries, the most common being those caused by curculio and other insects. Hence, proper spraying; prevention of insect injury, particularly that of plum curculio; and sanitation are the effective means of control of brown rot. The last-named measure, which consists in the destruction of rotted fruit and mummies and systematic renovation of bearing wood by proper pruning, is necessary in order to remove as many of the infected twigs as possible. No varieties have been seen under our conditions that are sufficiently resistant to withstand the disease.

SCAB

Peach scab produces shallow spots on the fruit without causing rot, and thus reduces the commercial value of the fruit by merely marring its appearance. This also is a fungous disease. The spots produced by it are small—from about the size of a pinhead to ⅛ inch in diameter—dark, and scattered over the surface of the fruit. The same sprays that are generally necessary for control of brown rot will effectively control scab, provided the fungicide—sulfur—is not omitted from the early sprays.

BACTERIAL LEAF SPOT

Bacterial leaf spot in severe form, leading to defoliation, is usually found on trees of low vigor, or those growing under conditions of some nutrient deficiency—the nature of which is still somewhat obscure. The affected parts of the leaf die, shrink, and fall out, giving the foliage a ragged appearance. On the fruit the spots appear much smaller than on the leaves, and produce small, shallow pits. As growth continues the fruit may crack at these spots. The damage has been known to be severe enough to cause considerable loss. With the advance of the season the leaves may fall, thus reducing still further the general vigor of the tree. Work done by Roberts and Pierce[1] and Kadow and Anderson[2] shows that spraying the trees with zinc sulfate, in combination with lime, prevents arsenical burning and dropping of the leaves due to the disease, thus effectively controlling at least the worst feature of this trouble, defoliation.

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[1]Roberts, John W., and Leslie Pierce. Zinc-lime: A fungicide for the peach. Phytopath. 22: 415-427. 1932.

[2]Kadow, K. J., and H. W. Anderson. The role of zinc sulphate in peach sprays. Ill. Agr. Exp. Sta., Bul. 414: 207-255. 1935.

LEAF CURL

Leaves affected with leaf curl become blistered and curled, later appear mildewed, and drop prematurely. This trouble also is caused by a specific fungus. Spores of the peach-leaf-curl fungus remain dormant on the bud scales until the next spring, when they infect newly developed leaves. A thorough application of a fungicide during the dormant period gives very effective control of peach leaf curl. The seriousness of this disease is not fully realized because the trees soon put out new foliage. They are materially weakened, however, and in a few seasons succumb to winter injury and insects.

Fig. 1—Peach leaf curl.

THE MORE IMPORTANT INSECTS AFFECTING PEACH AND THEIR CONTROL[1]

SCALE INSECTS

Two kinds of scale insects are commonly found on peaches. The more abundant is the San Jose scale. In small numbers these insects appear as grayish spots on the bark. In cases of heavy infestation they cause the trees to have a mottled appearance. The fruit is covered with red spots in places where the tiny insects are located. A dormant spray of 3 per cent lubricating oil, properly emulsified, gives satisfactory control. The terrapin scale also attacks peaches. It is less common, but may cause considerable damage if not treated. A 4 per cent emulsified lubricating-oil spray is necessary to control it in the dormant season. This insect is covered with a conical brownish scale about 1/12 inch in diameter.

[1]This chapter was written by W. W. Stanley, Assistant Entomologist of the Station.

PLUM CURCULIO

The plum curculio is a destructive pest of peach, plum, and other stone fruits. It is a dark-brown snouted beetle with whitish patches on its back. There are four humps on the back of this beetle, which readily distinguish it from other similar beetles. It attacks the fruit early in the spring and in early July, laying eggs in crescent-shaped holes. The curculio's egg in the fruit develops into a small, white, legless "worm". Infested young fruit soon drops to the ground, but fruit that is nearly grown will remain on the tree to produce the wormy part of the crop. Besides causing young fruit to drop, and developing worms in ripe fruit, this insect is responsible for a great amount of brown-rot infection, resulting from its feeding and egg-laying activities. Lead arsenate applied three times—at shuck-fall stage, ten days later, and a month before harvest—will keep this pest down.

ORIENTAL FRUIT MOTH

The oriental fruit moth causes damage while in the larval stage, in the form of pinkish worms. These worms burrow into the new growth of peach twigs and later in the season attack the fruit. The latter injury sometimes is not seen until the peaches are cut open. This insect also is responsible for a large amount of brown rot. No satisfactory method of control is yet known.

BORERS

The borer attacks the roots of peaches. This insect may be controlled either by digging out by hand or gassing with paradichlorobenzene. The latter method is by far the more practical and is therefore now generally employed. The material is applied in a ring around the tree, not closer to the trunk than 6 inches, between the 10th and 15th of October in Tennessee. It is not advised for trees less than 2 years of age. Two-year-old trees require ¼ ounce, removed in 3 weeks; 3-year-old, ¾ ounce, removed in 3 weeks; 4-year-old or more, 1 ounce. Trees weakened by disease are more quickly killed by the borers. Since control of this insect has no bearing on the spray program, it will not be discussed further.

LOCAL EXPERIMENTS ON CONTROL OF PEACH DISEASES AND INSECTS

LEAF CURL AND SCALES

Experiments were carried on in cooperation with the department of Entomology for control of leaf curl and scale, using creosote or wood oil. The results are reported elsewhere[1]. Of the combinations tried, the most effective was 2 per cent creosote with 3 per cent oil

[1]Stanley, W. W., S. Marcovitch, and J. O. Andes. Preliminary report on the use of creosote oil (wood oil) to control San Jose scale and peach leaf curl. Jour. Econ. Ent. 27: 785-788. 1934.

emulsion. Other tests made from year to year have consistently shown that entirely satisfactory results can be obtained also with either lime-sulfur 1-7 or a combination of 3 per cent oil with 2-4-50 bordeaux. Where an infestation of terrapin scale is found, 4 per cent oil is necessary for control. In applying dormant sprays for leaf-curl control it is necessary that thorough work be done and that the material be applied before the buds swell. Under Tennessee conditions it has been found that the dormant sprays for peaches are best applied in December and January. Where oils are used, the material should never be applied when the temperature is below 40° F.

BROWN ROT

Experiments in 1931

In 1931, experiments were started in Anderson County to determine the number of sprays necessary for disease control, the effectiveness of certain materials, and how to spray peaches without the serious burning usually associated with the use of the standard materials. The orchard used was not sprayed the year before, and the crop was a total loss from worms and brown rot.

The trees were divided into blocks requiring about 200 gallons of material each for an application. Ten trees from each sprayed block, selected at random, were used in making the counts of diseases and insect injuries. For checks, only 2 trees were left completely unsprayed. The sprayed trees received 5 sprays, which were applied on the following dates: Petal fall, April 17; shucks, April 30; two-weeks, May 18; fourth spray, June 16; fifth spray, July 8.

An insecticide was applied either alone or in combination with a fungicide in all blocks in each of the first 4 sprays—and insect control was effective.

The blocks of sprayed trees were treated as follows:

Block 1, with dry-mix sulfur, 5 sprays; lead arsenate added in first 4 sprays.

Block 2, with flotation sulfur, 5 sprays; lead arsenate plus lime added in first 4 sprays.

Block 3, no fungicide; only lead arsenate plus lime in first spray; last 4 sprays, flotation sulfur and Dutox.

Block 4, no fungicide; lead arsenate plus lime in first and second sprays; last 3 sprays, flotation sulfur and Dutox.

Block 5, no fungicide; lead arsenate plus lime in first, second, and third sprays; last 2 sprays, flotation sulfur and Dutox.

Materials were used at the following rates:

Dutox, 6 pounds to 200 gallons water; flotation sulfur, 20 pounds

to 200 gallons water; dry-mix, 8-8-½-50; lead arsenate, 1 pound to 50 gallons water.

The fruit from different blocks was gathered and graded August 7, 8 and 9, with results shown in table 1.

Table 1—*Showing the effects of different sprays tested in the experiment of 1931.*

Block No.	Materials and number of sprays	No. of fruits	No. brown rot	No. scab	Per cent brown rot	Per cent scab
1	Dry-mix, 5 sprays	3426	1	0	0.02	0.00
2	Flotation sulfur in 5 sprays	7089	0	7	0.00	.09
3	Flotation sulfur in last 4 sprays	6132	4	23	.07	.44
4	Flotation sulfur in last 3 sprays	4010	3	77	.07	1.92
5	Flotation sulfur in last 2 sprays	4438	6	618	.13	13.92
6	Two check trees, unsprayed	963	221	671	22.95	69.68

From table 1 it can be seen that any of the combinations used controlled the disease adequately. Scab became of sufficient intensity, however, to injure 13.92 per cent of the fruit when a fungicide was not applied before the middle of June. Since no trees were left without an insecticide, except the 2 check trees, the curculio damage was negligible, and no early brown rot developed.

In 1932 and 1933 no peach-spraying experiments were conducted, due to late-freeze destruction of the fruit.

Experiments in 1934

In 1934, the experiments were repeated in Roane County, the spraying dates being as follows: Petal fall, April 5; shucks, April 18; first cover, April 30; June, June 7; July, July 10.

The "complete" schedule comprised the last 4 sprays, with lead arsenate added in the shucks, first-cover, and July sprays. One block included an additional sulfur spray—petal fall—and the other blocks had sulfur in 3 sprays only. All blocks had sulfur in the July spray. On one block, wettable sulfur replaced dry-mix in July, to determine if any detrimental effects were produced on the foliage; and one block was sprayed with zinc sulfate-lime mixture for observations on its effect in preventing lead arsenate injury.

The brown rot on 4 unsprayed trees averaged 39.9 per cent of the total fruit, with no brown rot on any of the sprayed blocks. There was distinct lead-arsenate injury to the foliage on all sprayed blocks except the one treated with the zinc sulfate-lime combination. This block had much better and more vigorous foliage than the others, even though the soil was somewhat poorer. This was in accord with the reports from several similar experiments conducted by others, outside of Tennessee. Trees sprayed with wettable sulfur showed neither more nor less damage than those sprayed with the regular dry-mix.

Experiments in 1935

Experiments were again carried out in 1935 along lines similar

to those of previous years. The rates at which the materials were used were the same as in 1934, and wettable sulfur was used instead of dry-mix because of its greater convenience. The standard program of shucks, two-weeks, and June sprays was followed up to the July spray. On the advice of our department of Entomology, lead arsenate was added July 9. Earlier lead sprays had not caused appreciable damage up to this time. Previous experience had shown that lead arsenate applied this late usually gave considerable burning. Hence, to test the effectiveness of the zinc sulfate-lime combination in keeping down spray burn, the trees were divided into 3 blocks and sprayed as follows:

Block A—Hydrated lime	4	pounds
Zinc sulfate	4	"
Arsenate of lead	1	pound
Water	50	gallons
Block B—Wettable sulfur	8	pounds
Hydrated lime	4	"
Zinc sulfate	4	"
Arsenate of lead	1	pound
Water	50	gallons
Block C—Wettable sulfur	8	pounds
Hydrated lime	8	"
Arsenate of lead	1	pound
Water	50	gallons

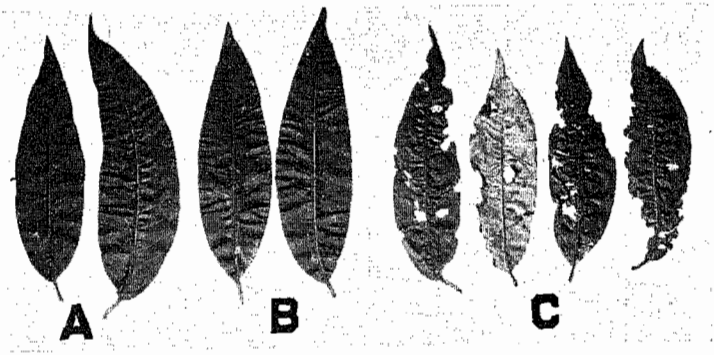

Fig. 2—A, leaves sprayed with lime, zinc sulfate, and arsenate of lead; B, same with addition of wettable sulfur; C, same as B but without zinc sulfate.

Notes taken July 19 show that severe damage was caused on block C, sprayed with lead arsenate without zinc sulfate, and no damage on the other blocks, sprayed with lead arsenate and zinc

sulfate-lime combination. There was no brown rot on the fruit in any of the other sprayed blocks, but all of the fruit on the unsprayed trees was lost on account of brown rot.

Later in the season, 2 dustings with sulfur were made on the trees to prevent brown rot from becoming established when the fruit was practically ripe. Under the conditions of this season—heavy oriental fruit moth infestation, and hence the expectation of serious development of brown rot—it was deemed necessary to apply additional sprays or dusts after July, until the fruit was harvested, to prevent brown rot from becoming destructive on ripe fruit. Although no experimental data were obtained on this point, definite observations on the results of applications of sulfur made according to the apparent need of individual orchards, and as required by weather conditions and moth infestation, indicate clearly that these late sprayings or dustings are profitable, enabling the growers to produce clean crops. In most cases where the preharvest sprays were left off, the loss was severe. Experience of peach growers in some other states indicates that sometimes even dusting harvested fruit with sulfur in the packing shed is profitable.

CONCLUSIONS

1. A dormant spray for peach leaf curl and scale is always necessary. Any one of the following 3 materials is effective: Lime-sulfur 1-7; bordeaux 2-4-50 with 3 per cent oil, or, if terrapin scale is present, 4 per cent oil; creosote oil 2 per cent with 3 per cent oil emulsion.

2. Four summer sprays are necessary under ordinary conditions. With conditions favorable for blossom blight (brown rot on the blossom), and with certain varieties particularly susceptible to blossom blight, as the Red Bird, a petal-fall spray of sulfur should be given in addition to the 4 later sprays. One or more preharvest applications of sulfur spray or dust, after the July spray, should be made if the season is rainy, if oriental fruit moth is active, or if other conditions indicate the probability of brown-rot development on ripe fruit. Insecticides should not be applied in these preharvest sprays.

3. Sulfur sprays should be applied early in the season to prevent peach scab, at least in the 10-day spray.

4. Wettable sulfur manufactured by a reliable producer may be satisfactorily used in place of dry-mix. Flotation sulfur is likewise satisfactory to replace dry-mix, and may be safely used at the rate of 5 pounds to 50 gallons.

5. Barium fluosilicate (Dutox) is compatible with flotation sulfur for spraying peaches, but not with dry-mix where lime is used.

6. The use of a combination made up of 4 pounds zinc sulfate and 4 pounds hydrated lime per 50 gallons, when lead arsenate is added, will materially decrease injury from lead arsenate and defoliation by leaf-spot bacteria and will maintain a good condition of the foliage.

Caution.—Some growers have had disastrous results from adding zinc sulfate to their mixtures without using the required amount of hydrated lime. Dry-mix calls for 8 pounds of sulfur, 8 pounds of lime, and a wetting agent, so that where lead arsenate and zinc sulfate are used there is enough lime to neutralize the zinc sulfate. The mistake came when growers used wettable sulfur, lead arsenate, and zinc but added no lime. When zinc sulfate is used there must be in the mixture with it at least as much, by weight, of good hydrated lime.

SPRAY PROGRAM FOR PEACHES

Date of application	Disease or insect	Amount of material to use for each 50 gallons of mixture
When trees are dormant	Scales and leaf curl	Either 2-4-50 bordeaux with 2¼ gallons 66 per cent oil emulsion, or 7 gallons of 33° lime-sulfur
"Shuck" stage, as dried floral parts are falling	Curculio	Dry-mix[1] 8-8-½, zinc sulfate 4[2] pounds, and lead arsenate 1 pound
First cover spray—about 2 weeks later	Curculio and scab	Same as calyx
June spray	Scab and brown rot	Dry-mix 8-4-½; or wettable sulfur; or flotation, alone
July spray	Curculio and brown rot	Dry-mix[1] 8-8-½, zinc sulfate 4[2] pounds, and lead arsenate 1 pound
Later sprays (see text)	Brown rot in rainy seasons	Wettable sulfur 8 pounds[3] or Flotation sulfur 5 pounds[3]

[1]Wettable sulfur may replace sulfur and the wetting agent in the dry-mix formula, at the same rate as sulfur, the other ingredients being the same. Flotation sulfur may replace the sulfur at the rate of 5 pounds for 8 pounds of sulfur.

[2]Four pounds was the amount tested in our experiments. It was found, however, at the Illinois Experiment Station that 3 pounds was sufficient.

[3]At this late stage dry-mix is not recommended, because of the spray residue it leaves on the fruit.